Report to

**THE INTERNATIONAL JOINT COMMISSION**

**on**

**THE DIVISION OF THE WATERS OF THE**

# ST. MARY AND MILK RIVERS

**1982**

by

**D.A. Davis**
representing Canada

and

**Philip Cohen**
representing the United States

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March 1983

International Joint Commission
Ottawa, Ontario and Washington, D.C.

Gentlemen:

In compliance with the provisions of Clause VIII (c) of your order of October 4, 1921, directing the division of the waters of St. Mary and Milk Rivers between the United States and Canada, we are transmitting herewith a report on the operations during the irrigation season ended October 31, 1982.

Respectfully submitted,

D.A. Davis
Accredited Officer of Her Majesty

Philip Cohen
Accredited Officer of the United States

## SYNOPSIS

During the 1982 irrigation season the natural flow of the St. Mary and Milk Rivers was 94 percent and 112 percent, respectively, of the long-term average.

The natural flow of the St. Mary River at the International Boundary during the irrigation season, April 1 to October 31, 1982, was 686 000 cubic decametres ($dam^3$) (556,000 acre-feet). Under the terms of the Treaty, the Canadian share was 412 000 $dam^3$ (334,000 acre-feet). The total flow recorded at the International Boundary during the irrigation season was 135 percent of the Canadian allotment. Construction on the Lake Sherburne outlet structure in August and September prompted large precautionary releases in July and an early closing of the dam and, consequently, the St. Mary Canal.

The natural flow of the Milk River at the Eastern Crossing of the International Boundary from March 1 to October 31, 1982, was 164 000 $dam^3$ (133,000 acre-feet) with no adjustments for upstream use by Canada and the United States. Under the terms of the Treaty, the United States' allotment was 109 000 $dam^3$ (88,400 acre-feet). An accurate determination of natural flow and apportionment of the flow of the Milk River historically has not been made, as it is assumed that United States and Canadian uses generally are less than their respective shares. However, increasing use in both countries and the potential for constructing a major storage reservoir in Canada have resulted in a joint study to derive methods for more accurately determining natural flow at the Eastern Crossing of the International Boundary. A report on the accomplishments of the study has been prepared and was discussed at the annual conference. Major revisions and continued investigations were suggested by the Field Representatives.

The natural flow of the three eastern tributaries of the Milk River that are apportioned, Lodge Creek, Battle Creek, and Frenchman River, was 107 percent, 110 percent, and 133 percent, respectively, of the long-term averages. The combined natural flow of these tributaries was 190 000 $dam^3$ (154,000 acre-feet), of which the United States received 127 000 $dam^3$ (103,000 acre-feet). All deficits that occurred within individual apportionment periods were refunded by the end of the irrigation season.

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## INTRODUCTION

Article VI of the Boundary Waters Treaty of 1909 between Great Britain and the United States governs the apportionment of the waters of the St. Mary and Milk Rivers. The terms of the Treaty were further clarified by the 1921 Order of the International Joint Commission. Copies of Article VI and the 1921 Order are contained in Annex A of this report. To comply with this Treaty, Field Representatives of the United States and Canada collected and compiled, on a cooperative basis, hydrometric data at 38 international gauging stations. An additional 39 gauging stations were operated independently by Canada or the United States to obtain data on diversions, reservoir contents, return flows, and index runoff. Most of this additional information is used to improve the accuracy of natural-flow computations.

This report summarizes the natural-flow computations during 1982, comments on the apportionment of the natural flow, and explains any unusual occurrences throughout the year as well as any modifications that have been or are being contemplated for increasing the accuracy of the natural-flow computations. Summary natural-flow tables are included in the report. Detailed natural-flow computations are included in Appendix A. The daily discharge and other related data for 1982 are included in Appendix B. Appendices A and B are submitted with this report under separate cover.

In accordance with the SI conversion schedule established by the International Joint Commission, this report uses SI units first, followed by inch-pound units in parentheses. Data in tables are shown in SI units first, followed by the respective inch-pound units, for example Tables 1 and 1A.

The format for Appendices A and B of the report is SI units only. All Canadian data are published in SI units. United States data that were computed in

inch-pound units were converted to SI units using the appropriate conversions. A summary of the conversion factors is contained in Annex B.

Mr. D. A. Davis, Regional Director, Western and Northern Region, Inland Waters Directorate, as Accredited Officer of Her Majesty, was represented in the field by Mr. G. H. Morton, Regional Chief, Water Resources Branch, Calgary, Alberta and Mr. R. A. Halliday, Regional Chief, Water Resources Branch, Regina, Saskatchewan. Mr. Philip Cohen, Chief Hydrologist, United States Geological Survey, as Accredited Officer of the United States, was represented in the field by Mr. G. M. Pike, District Chief, United States Geological Survey, Helena, Montana. This report was prepared jointly by personnel of the Water Survey of Canada and the United States Geological Survey under the supervision of Messrs. Morton, Halliday, and Pike.

The annual conference of the Field Representatives was held in Calgary, Alberta, on February 2, 1983. Streamflow records collected jointly by Canada and the United States were reviewed and approved. Mutual problems and changes in computational procedures were discussed and a schedule of field operations for 1983 adopted.

## ST. MARY RIVER

During the irrigation season, April 1 to October 31, Canada's share of the natural flow of the St. Mary River at the International Boundary, as stipulated by the 1921 Order, will be three-fourths of the natural flow when that flow is 666 cubic feet per second (18.86 cubic metres per second) or less. Flows in excess of that amount will be divided equally between Canada and the United States. During the non-irrigation season, November 1 to March 31, the flow will be divided equally between the two countries.

To comply with the above order, representatives of both countries make semi-monthly computations of the daily natural flow of the St. Mary River during the irrigation season. If use by the United States is in excess of its share, then at the earliest opportunity, a delivery of an equivalent quantity of water is made to Canada. Regular interim reports of these computations are sent to all agencies involved in the water use and management of the flow of the St. Mary River. The interim reports keep these agencies informed as to the quantity of water available.

Tentative computations and interim reports are not made during the non-irrigation season when use by the United States is limited to storage in Lake Sherburne. The flow into Lake Sherburne is considerably less than 50 percent of the natural flow. Occasionally, diversion into the St. Mary Canal extends beyond the irrigation season, necessitating additional tentative computations.

Lake Sherburne, the only storage reservoir within the St. Mary River basin in the United States, is used to store a portion of the United States' share of flows for diversion to the Milk River. This water, which passes through Canada, is used by the United States for irrigation in the eastern Milk River valley.

Storage in Lake Sherburne was 9 300 $dam^3$ (7,540 acre-feet) on October 31, 1981, and had increased to 25 900 $dam^3$ (21,000 acre-feet) just prior to the irrigation season on March 31, 1982. Maximum storage was 49 700 $dam^3$ (40,300 acre-feet) on July 3 and storage decreased to 31 600 $dam^3$ (25,600 acre-feet) by the end of the irrigation season on October 31, 1982.

Water was diverted from the St. Mary River into the St. Mary Canal leading to the Milk River from May 1 to August 2, 1982. The total flow recorded at the gauging station on the St. Mary Canal at St. Mary Crossing (station 05AE029)

was 123 000 $dam^3$ (99,700 acre-feet). Any seepage from the canal between the point of diversion and the crossing of the St. Mary River is assumed to return to the river and eventually become available to Canada.

The irrigation season was shortened this year by construction on the outlet structure of Lake Sherburne. This work was required because of dam safety upgrading. In anticipation of the August closure of the dam, the level of Lake Sherburne was lowered throughout July. This resulted in large excess flows at the International Boundary for the two July division periods and a small deficit flow for the first period in September before the outlet was reopened.

The total natural flow of the St. Mary River at the International Boundary from November 1, 1981, to October 31, 1982, was 743 000 $dam^3$ (602,000 acre-feet), of which 686 000 $dam^3$ (556,000 acre-feet) occurred during the irrigation season, April 1 to October 31, 1982. For the irrigation season, Canada's and the United States' shares were 412 000 $dam^3$ (334,000 acre-feet) and 274 000 $dam^3$ (222,000 acre-feet), respectively. A total discharge of 557 000 $dam^3$ (452,000 acre-feet) was recorded at the International Boundary, which was 135 percent of the Canadian share. The computed natural flow during the irrigation season was 94 percent of the average of the previous 80 years of record.

Deficit deliveries were recorded in 2 of the 14 division periods during the 1982 irrigation season. The deficits, which occurred during the May 1 to 15 and the September 1 to 15 division periods, were refunded during the succeeding periods.

Tables 1 and 1A, which follow, summarize the apportionment of the waters of the St. Mary River.

# TABLE 1

## SUMMARY OF DIVISION OF ST. MARY RIVER AND DIVERSION TO MILK RIVER

## 1982

QUANTITIES IN CUBIC DECAMETRES

| MONTH | St. MARY RIVER AT INTERNATIONAL BOUNDARY | | | | EXCESS REC'D BY CANADA | CHANGE IN STORAGE – LAKE SHERBURNE | TOTAL AVAILABLE FOR DIVERSION | St. MARY CANAL AT St. MARY CROSSING | MILK * RIVER AT EASTERN CROSSING |
|---|---|---|---|---|---|---|---|---|---|
| | RECORDED FLOW | NATURAL FLOW | U.S. SHARE | CANADA'S SHARE | | | | | |
| APR. | 19 106 | 21 449 | 5 365 | 16 084 | 3 022 | 2 344 | 3 022 | 0 | 66 800 |
| MAY | 105 867 | 128 334 | 51 633 | 76 701 | 29 166 | -16 693 | 68 326 | 39 160 | 60 551 |
| JUN. | 185 721 | 261 899 | 118 707 | 143 192 | 42 529 | 37 171 | 81 535 | 39 006 | 64 135 |
| JUL. | 153 035 | 158 168 | 66 437 | 91 730 | 61 304 | -39 324 | 105 761 | 44 457 | 51 802 |
| AUG. | 49 595 | 60 387 | 18 217 | 42 170 | 7 425 | 10 792 | 7 425 | 0 | 5 869 |
| SEP. | 21 511 | 27 955 | 6 987 | 20 967 | 543 | 6 444 | 543 | 0 | 1 781 |
| OCT. | 22 000 | 27 715 | 6 929 | 20 786 | 1 214 | 5 715 | 1 214 | 0 | 3 347 |
| TOTAL IRRIGATION SEASON | 556 835 | 685 907 | 274 275 | 411 630 | 145 203 | 6 449 | 267 826 | 122 623 | 254 285 |

* Milk River at Eastern Crossing is the natural flow of the Milk River plus water diverted from the St. Mary River.

QUANTITIES FOR ST. MARY RIVER DIVISION PERIODS, IN CUBIC DECAMETRES

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | CANADA'S SHARE | RECEIVED BY CANADA | RECEIVED BY CANADA | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| APR. 1 TO APR. 15 | 7 367 | 5 524 | 6 143 | 619 | |
| APR 16 TO APR. 30 | 14 083 | 10 560 | 12 962 | 2 403 | |
| MAY 1 TO MAY 15 | 27 916 | 19 967 | 18 910 | | 1 057 |
| MAY 16 TO MAY 31 | 100 418 | 56 734 | 86 957 | 30 223 | |
| JUN. 1 TO JUN 15 | 102 505 | 57 373 | 81 252 | 23 879 | |
| JUN. 16 TO JUN. 30 | 159 394 | 85 819 | 104 470 | 18 650 | |
| JUL. 1 TO JUL. 15 | 104 088 | 58 165 | 89 546 | 31 380 | |
| JUL. 16 TO JUL. 31 | 54 080 | 33 565 | 63 489 | 29 924 | |
| AUG. 1 TO AUG. 15 | 36 530 | 24 383 | 31 050 | 6 667 | |
| AUG. 16 TO AUG. 31 | 23 857 | 17 787 | 18 545 | 758 | |
| SEP. 1 TO SEP. 15 | 15 639 | 11 731 | 11 680 | | 51 |
| SEP. 16 TO SEP. 30 | 12 316 | 9 236 | 9 830 | 595 | |
| OCT. 1 TO OCT. 15 | 12 509 | 9 380 | 10 251 | 871 | |
| OCT. 16 TO OCT 31 | 15 206 | 11 406 | 11 749 | 343 | |

This table is a summary of data contained in Table 5, Appendix A.

# TABLE 1A

## SUMMARY OF DIVISION OF ST. MARY RIVER AND DIVERSION TO MILK RIVER

## 1982

QUANTITIES IN ACRE-FEET

| MONTH | St. MARY RIVER AT INTERNATIONAL BOUNDARY | | | | EXCESS REC'D BY CANADA | CHANGE IN STORAGE-LAKE SHERBURNE | TOTAL AVAILABLE FOR DIVERSION | St. MARY CANAL AT St. MARY CROSSING | MILK * RIVER AT EASTERN CROSSING |
|---|---|---|---|---|---|---|---|---|---|
| | RECORDED FLOW | NATURAL FLOW | U.S. SHARE | CANADA'S SHARE | | | | | |
| APR. | 15,489 | 17,389 | 4,350 | 13,040 | 2,450 | 1,900 | 2,450 | 0 | 54,156 |
| MAY | 85,828 | 104,043 | 41,860 | 62,183 | 23,645 | -13,534 | 55,393 | 31,748 | 49,090 |
| JUN. | 150,567 | 212,326 | 96,237 | 116,088 | 34,479 | 30,136 | 66,102 | 31,623 | 51,995 |
| JUL. | 124,068 | 128,229 | 53,862 | 74,367 | 49,701 | -31,880 | 85,743 | 36,042 | 41,997 |
| AUG. | 40,208 | 48,957 | 14,769 | 34,188 | 6,020 | 8,749 | 6,020 | 0 | 4,758 |
| SEP. | 17,439 | 22,663 | 5,665 | 16,999 | 440 | 5,225 | 440 | 0 | 1,444 |
| OCT. | 17,836 | 22,469 | 5,617 | 16,852 | 984 | 4,633 | 984 | 0 | 2,713 |
| TOTAL IRRIGATION SEASON | 451,435 | 556,076 | 222,360 | 333,717 | 117,719 | 5,229 | 217,132 | 99,413 | 206,153 |

* Milk River at Eastern Crossing is the natural flow of the Milk River plus water diverted from the St. Mary River.

### QUANTITIES FOR ST. MARY RIVER DIVISION PERIODS, IN ACRE-FEET

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | CANADA'S SHARE | RECEIVED BY CANADA | RECEIVED BY CANADA | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| APR. 1 TO APR. 15 | 5,972 | 4,479 | 4,981 | 502 | |
| APR. 16 TO APR. 30 | 11,417 | 8,561 | 10,509 | 1,948 | |
| MAY 1 TO MAY 15 | 22,632 | 16,187 | 15,330 | | 857 |
| MAY 16 TO MAY 31 | 81,411 | 45,995 | 70,498 | 24,502 | |
| JUN. 1 TO JUN. 15 | 83,103 | 46,513 | 65,872 | 19,359 | |
| JUN. 16 TO JUN. 30 | 129,223 | 69,575 | 84,695 | 15,120 | |
| JUL. 1 TO JUL. 15 | 84,386 | 47,156 | 72,596 | 25,440 | |
| JUL. 16 TO JUL. 31 | 43,843 | 27,212 | 51,472 | 24,260 | |
| AUG. 1 TO AUG. 15 | 29,616 | 19,768 | 25,173 | 5,405 | |
| AUG. 16 TO AUG. 31 | 19,341 | 14,420 | 15,035 | 615 | |
| SEP. 1 TO SEP. 15 | 12,679 | 9,511 | 9,469 | | 42 |
| SEP. 16 TO SEP. 30 | 9,985 | 7,488 | 7,970 | 482 | |
| OCT. 1 TO OCT. 15 | 10,142 | 7,605 | 8,311 | 706 | |
| OCT. 16 TO OCT 31 | 12,327 | 9,247 | 9,525 | 278 | |

This table was prepared from computed data and may not agree with exact conversions from table 1.

## MILK RIVER

During the irrigation season, April 1 to October 31, the United States' share of the natural flow of the Milk River at the Eastern Crossing of the International Boundary, as stipulated by the 1921 Order, will be three-fourths of the natural flow when that flow is 666 cubic feet per second (18.86 cubic metres per second) or less. Flows in excess of that amount will be divided equally between the United States and Canada. During the non-irrigation season, November 1 to March 31, the flow will be divided equally between the two countries.

To comply with the above order, representatives of both countries make monthly computations of the natural flow of the Milk River during the irrigation season. This computation includes adjustment for the water diverted from the St. Mary River basin and evapotranspiration losses but does not include a computation of water used or stored by Canada or the United States within the Milk River basin itself. Historically it has been assumed that Canada's and the United States' uses are less than their respective shares and no formal apportionment has been made. However, several consecutive dry years and the increasing use of sprinkler-irrigation systems have resulted in increased use by Canadian and United States irrigators. To evaluate the significance of the increased use, a joint, natural-flow study is being conducted by Canada and the United States. In addition, the potential construction of a major storage reservoir on the Milk River in Canada necessitates the development of a more comprehensive natural-flow and water-division procedure.

In support of a natural flow study, gauging stations were constructed at Milk River near Pendant d'Oreille (station 11AA035) and at Milk River near Writing-on-Stone Park (station 11AA034). These stations were operated during the irrigation seasons from 1978 to 1982. In August of 1980 a number of miscellaneous measurements were made on the Milk River between Writing-on-Stone Park and Eastern Crossing of the International Boundary. In the 1981 and 1982 field seasons, this measurement program was expanded to include the entire reach in Canada. Preliminary analysis of the measurement data indicated neither a gain nor a loss trend.

In addition, ground-water movement and evapotranspiration studies are being conducted to help determine the effects of these factors on surface flow. A number of wells were drilled in late 1981 to monitor ground-water levels and gradients and to provide data for the evapotranspiration study. Also, to provide information for use in the evapotranspiration study, a water-level station was installed in late 1981 on the Milk River at 880 Bridge, located slightly upstream from Breed Creek.

An index streamflow station on a major tributary along with several miscellaneous measurement sites are to be established early in 1983 in an attempt to determine tributary inflow.

An interim report was reviewed at the 1982 International Records Conference in Calgary. The Field Representatives agreed that further study is needed in several critical aspects of determining natural flow.

The natural flow of the Milk River at Eastern Crossing of the International Boundary from March 1 to October 31, 1982, was 164 000 $dam^3$ (133,000 acre-feet).

This is 112 percent of the average natural flow of the previous 70 years of record. The respective shares of the United States and Canada were 109 000 $dam^3$ (88,400 acre-feet) and 55 100 $dam^3$ (44,700 acre-feet) from March 1 to October 31, 1982. The computations for determining the natural flow of the Milk River at its eastern crossing are given in Table 8 in Appendix A.

The total flow recorded at the gauging station on the Milk River at Eastern Crossing of the International Boundary (station 11AA031) from March 1 to October 31, 1982, was 277 000 $dam^3$ (225,000 acre-feet). The recorded flow is composed of the natural flow of the Milk River, plus diverted St. Mary River water, which is used by downstream Milk River users in the United States.

## EASTERN TRIBUTARIES OF THE MILK RIVER

The waters of the eastern tributaries of the Milk River are divided in accordance with the Order of the International Joint Commission dated October 4, 1921, which stipulates under Rule III that "The natural flow of the eastern (otherwise known as the Saskatchewan or northern) tributaries of the Milk River at the points where they cross the international boundary shall be divided equally between the two countries." This order might well be interpreted as requiring that the division of water be made on a continuing basis. However, the physical limitation due to transit time in the flow system was recognized. Further analyses showed that the minimum practical time frame for compilation of the natural flows at the International Boundary was a 10-day period.

Prior to 1937, Canadian use along the eastern tributaries consisted of domestic irrigation and the Canadian share of the natural flow was not fully used.

The construction of Eastend Reservoir (station 11AC055), Huff Lake (station 11AC063), and Newton Lake (station 11AC056) by the Government of Canada on the Frenchman River during the late 1930's made an operational division of flow on this tributary necessary by 1937.

The redevelopment of several private irrigation projects and the construction of the Vidora Irrigation Project during the early 1950's resulted in increased use of Battle Creek water in Canada and made an operational division of flow on this tributary necessary by 1957.

Construction of Altawan Reservoir (station 11AB089) and Spangler Irrigation Project on Lodge Creek in 1960 made an operational division of flow on this tributary necessary by 1961.

During the runoff season, March 1 to October 31, 10-day computations of the natural flows of Lodge Creek, Battle Creek and Frenchman River are made to determine each country's share. If use by Canada is in excess of its share, then at the earliest opportunity a delivery of an equivalent quantity of water is made to the United States. During some years the United States may request that delivery of deficit water on Battle Creek be delayed to allow better use by United States irrigators. Canada may honor this request if no regulation problems are anticipated by delaying the delivery of water to refund the deficit. Regular interim reports on the progress of the division of the natural flows of Lodge Creek, Battle Creek, and Frenchman River at the International Boundary were distributed to interested agencies throughout the runoff season. No division of flow is made during the winter as flow and use generally are small and streamflow records are impractical to obtain.

Lyons Creek is monitored but does not have sufficient use in Canada at this time to warrant an operational division of flow. A flow of 4 470 $dam^3$ (3,620 acre-feet) was recorded on this tributary from March 1 to October 31, 1982. During 1982 there were no changes made to the network of hydrometric stations in the eastern tributaries. However, a change in procedure involving a water balance approach on Middle Creek Reservoir was adopted for 1982. Also, the name of the station Middle Creek near Alberta Boundary (11AB009) was changed to Middle Creek near Saskatchewan Boundary. The station was also upgraded with a sheet metal control and it was monitored on a 10-day basis during the irrigation season.

Estimates of unmeasured diversions to private irrigation projects in the Lodge Creek, Battle Creek, and Frenchman River basins in Saskatchewan were provided by Saskatchewan Environment, and for the Lodge Creek basin in Alberta by Alberta Environment. These estimates are based on reports received from the operators of individual projects and by onsite inspections. An additional charge is made for domestic projects in the Battle Creek and Frenchman River basins based on the results of studies conducted by Canada on domestic use.

For the interim reports prepared at the end of apportionment periods, an estimate of minor diversion use is made based on a correlation between annual natural flows and reported use for previous years. The total natural flow for the current year is derived from computed natural flow to date plus an estimate of runoff volume for the rest of the year dependent on runoff conditions. At the end of the year, the actual flow is known and a final estimate of minor diversions is made based on reported use; consequently, some discrepancy exists between interim and final division computations. Lists of reported and estimated diversions for 1982 are contained in Appendix B.

The combined usable storage of the six major Canadian reservoirs increased from 8 230 $dam^3$ (6,670 acre-feet), or 6 percent, to 35 000 $dam^3$ (28,400 acre-feet) or 25 percent, of the total usable storage from March 1 to October 31, 1982. A study of the Cypress Lake natural overflow computational procedures is planned for 1983. This study will also examine procedures that are used when the storage in the natural lake is completely depleted.

LODGE CREEK

The computed natural flow of Lodge Creek below McRae Creek at the International Boundary (station 11AB083) from March 1 to October 31, 1982, was 38 800 $dam^3$ (31,500 acre-feet) or 107 percent of the average natural flow of the previous 32 years of record. Each country is entitled to 50 percent of the natural flow. A total flow of 22 400 $dam^3$ (18,200 acre-feet) was recorded at the International Boundary.

Deficit deliveries were recorded in 2 of the 24 division periods during the season. These deficits were refunded within two division periods.

A return flow of 181 $dam^3$ (147 acre-feet) was recorded at Squaw Coulee near Willow Creek (station 11AB103) from the 2 660 $dam^3$ (2,160 acre-feet) diverted from Lodge Creek by Spangler Ditch (station 11AB060).

The division of the Lodge Creek natural flow is summarized in Tables 2 and 2A, which follow. The detailed computation of the natural flow is given in Table 9 and the historical summary in Table 10 of Appendix A.

# TABLE 2

## SUMMARY OF LODGE CREEK DIVISION
## 1982

QUANTITIES IN CUBIC DECAMETRES

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | U.S.A. SHARE | RECEIVED BY U.S.A. | RECEIVED BY U.S.A. | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| MAR. 1 - MAR. 10 | 0 | 0 | 0 | 0 | |
| MAR. 11 - MAR 20 | 0 | 0 | 0 | 0 | |
| MAR. 21 - MAR. 31 | 0 | 0 | 0 | 0 | |
| APR. 1 - APR. 10 | 0 | 0 | 0 | 0 | |
| APR. 11 - APR. 20 | 7 440 | 3 720 | 4 537 | 817 | |
| APR. 21 - APR. 30 | 16 395 | 8 198 | 9 086 | 888 | |
| MAY 1 - MAY 10 | 2 466 | 1 233 | 542 | | 691 |
| MAY 11 - MAY 20 | 622 | 311 | 488 | 177 | |
| MAY 21 - MAY 31 | 3 113 | 1 557 | 2 141 | 584 | |
| JUN. 1 - JUN. 10 | 7 689 | 3 845 | 4 948 | 1 103 | |
| JUN. 11 - JUN. 20 | 862 | 431 | 364 | | 67 |
| JUN. 21 - JUN 30 | 185 | 93 | 158 | 65 | |
| JUL. 1 - JUL. 10 | 26 | 13 | 106 | 93 | |
| JUL. 11 - JUL. 20 | 0 | 0 | 42 | 42 | |
| JUL. 21 - JUL. 30 | 0 | 0 | 6 | 6 | |
| AUG. 1 - AUG. 10 | 0 | 0 | 0 | 0 | |
| AUG. 11 - AUG. 20 | 0 | 0 | 0 | 0 | |
| AUG. 21 - AUG. 31 | 0 | 0 | 0 | 0 | |
| SEP. 1 - SEP. 10 | 0 | 0 | 0 | 0 | |
| SEP. 11 - SEP. 20 | 0 | 0 | 0 | 0 | |
| SEP. 21 - SEP. 30 | 0 | 0 | 0 | 0 | |
| OCT. 1 - OCT. 10 | 0 | 0 | 0 | 0 | |
| OCT. 11 - OCT. 20 | 0 | 0 | 0 | 0 | |
| OCT. 21 - OCT. 31 | 0 | 0 | 0 | 0 | |
| TOTAL-cubic decametres | 38 798 | 19 401 | 22 418 | | |

# TABLE 2A
# SUMMARY OF LODGE CREEK DIVISION
# 1982

QUANTITIES IN ACRE-FEET

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | U.S.A. SHARE | RECEIVED BY U.S.A. | RECEIVED BY U.S.A. | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| MAR. 1 - MAR. 10 | 0 | 0 | 0 | 0 | |
| MAR. 11 - MAR 20 | 0 | 0 | 0 | 0 | |
| MAR. 21 - MAR. 31 | 0 | 0 | 0 | 0 | |
| APR. 1 - APR. 10 | 0 | 0 | 0 | 0 | |
| APR. 11 - APR 20 | 6,032 | 3,016 | 3,678 | 662 | |
| APR. 21 - APR. 30 | 13,291 | 6,646 | 7,366 | 720 | |
| MAY 1 - MAY 10 | 1,999 | 1,000 | 439 | | 560 |
| MAY 11 - MAY 20 | 504 | 252 | 396 | 143 | |
| MAY 21 - MAY 31 | 2,524 | 1,262 | 1,736 | 473 | |
| JUN. 1 - JUN. 10 | 6,233 | 3,117 | 4,011 | 894 | |
| JUN. 11 - JUN. 20 | 699 | 349 | 295 | | 54 |
| JUN. 21 - JUN 30 | 150 | 75 | 128 | 53 | |
| JUL. 1 - JUL. 10 | 21 | 11 | 86 | 75 | |
| JUL. 11 - JUL. 20 | 0 | 0 | 34 | 34 | |
| JUL. 21 - JUL. 30 | 0 | 0 | 5 | 5 | |
| AUG. 1 - AUG. 10 | 0 | 0 | 0 | 0 | |
| AUG. 11 - AUG. 20 | 0 | 0 | 0 | 0 | |
| AUG. 21 - AUG. 31 | 0 | 0 | 0 | 0 | |
| SEP. 1 - SEP. 10 | 0 | 0 | 0 | 0 | |
| SEP. 11 - SEP. 20 | 0 | 0 | 0 | 0 | |
| SEP. 21 - SEP. 30 | 0 | 0 | 0 | 0 | |
| OCT. 1 - OCT. 10 | 0 | 0 | 0 | 0 | |
| OCT. 11 - OCT. 20 | 0 | 0 | 0 | 0 | |
| OCT. 21 - OCT. 31 | 0 | 0 | 0 | 0 | |
| TOTAL-acre-feet | 31,454 | 15,728 | 18,174 | | |

BATTLE CREEK

The computed natural flow of Battle Creek at the International Boundary from March 1 to October 31, 1982, was 36 100 $dam^3$ (29,300 acre-feet) or 110 percent of the average natural flow of the previous 42 years of record. Each country is entitled to 50 percent of the natural flow. A total flow of 21 900 $dam^3$ (17,800 acre-feet) was recorded at the International Boundary.

Deficit deliveries were recorded in 4 of the 24 division periods during the season. These deficits were refunded over a number of division periods. A return flow of 35 percent of diversion, based on a 1972-76 study, was used for the Gaff Ditch diversion from Battle Creek. The recorded flow at Gaff Ditch near Merryflat from March 1 to October 31, 1982, was 1 890 $dam^3$ (1,530 acre-feet) with the return flow computed at 35 percent, or 662 $dam^3$ (537 acre-feet). During the irrigation period the return flow was computed to be 32 percent for Vidora, Richardson, and McKinnon Ditches and 26 percent for Nashlyn Canal.

A supplementary gauging station has been operated since 1981 on Shepherd Ditch, a private diversion on Battle Creek, located downstream from Gaff Ditch. A total diversion of 733 $dam^3$ (594 acre-feet) was recorded at this station during 1982, and is included in the list of miscellaneous diversions for Battle Creek in Appendix B.

The division of the Battle Creek natural flow is summarized in Tables 3 and 3A, which follow. The detailed computation of the natural flow is given in Table 11 and the historical summary in Table 12 of Appendix A.

# TABLE 3
## SUMMARY OF BATTLE CREEK DIVISION
## 1982

QUANTITIES IN CUBIC DECAMETRES

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | U.S.A. SHARE | RECEIVED BY U.S.A. | RECEIVED BY U.S.A. | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| MAR. 1 - MAR. 14 | 11 | 6 | 10 | 4 | |
| MAR. 15 - MAR. 25 | 27 | 14 | 24 | 10 | |
| MAR. 26 - APR. 4 | 347 | 174 | 308 | 134 | |
| APR. 5 - APR. 14 | 3 966 | 1 983 | 3 519 | 1 536 | |
| APR. 15 - APR. 24 | 6 262 | 3 131 | 4 349 | 1 218 | |
| APR. 25 - MAY 4 | 4 549 | 2 275 | 805 | | 1 470 |
| MAY 5 - MAY 14 | 1 401 | 701 | 430 | | 271 |
| MAY 15 - MAY 25 | 1 185 | 593 | 725 | 132 | |
| MAY 26 - JUN. 4 | 3 007 | 1 504 | 1 983 | 479 | |
| JUN. 5 - JUN. 14 | 7 860 | 3 930 | 3 119 | | 811 |
| JUN. 15 - JUN. 24 | 2 046 | 1 023 | 1 326 | 303 | |
| JUN. 25 - JUL. 4 | 937 | 469 | 1 357 | 888 | |
| JUL. 5 - JUL. 14 | 981 | 491 | 1 053 | 562 | |
| JUL. 15 - JUL. 25 | 1 050 | 525 | 853 | 328 | |
| JUL. 26 - AUG. 4 | 302 | 151 | 134 | | 17 |
| AUG. 5 - AUG. 14 | 211 | 106 | 187 | 81 | |
| AUG. 15 - AUG. 25 | 181 | 91 | 161 | 70 | |
| AUG. 26 - SEP. 4 | 119 | 60 | 106 | 46 | |
| SEP. 5 - SEP. 14 | 80 | 40 | 71 | 31 | |
| SEP. 15 - SEP. 24 | 47 | 24 | 42 | 18 | |
| SEP. 25 - OCT. 4 | 242 | 121 | 215 | 94 | |
| OCT. 5 - OCT. 14 | 465 | 233 | 413 | 180 | |
| OCT. 15 - OCT. 25 | 538 | 269 | 477 | 208 | |
| OCT. 26 - OCT. 31 | 308 | 154 | 273 | 119 | |
| TOTAL-cubic decametres | 36 122 | 18 068 | 21 940 | | |

# TABLE 3A
# SUMMARY OF BATTLE CREEK DIVISION
# 1982

QUANTITIES IN ACRE-FEET

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | U.S.A. SHARE | RECEIVED BY U.S.A. | RECEIVED BY U.S.A. | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| MAR. 1 - MAR. 14 | 9 | 5 | 8 | 3 | |
| MAR. 15 - MAR. 25 | 22 | 11 | 19 | 8 | |
| MAR. 26 - APR. 4 | 281 | 141 | 250 | 109 | |
| APR. 5 - APR. 14 | 3,215 | 1,608 | 2,853 | 1,245 | |
| APR. 15 - APR. 24 | 5,077 | 2,538 | 3,526 | 987 | |
| APR. 25 - MAY 4 | 3,688 | 1,844 | 653 | | 1,192 |
| MAY 5 - MAY 14 | 1,136 | 568 | 349 | | 220 |
| MAY 15 - MAY 25 | 961 | 481 | 588 | 107 | |
| MAY 26 - JUN. 4 | 2,438 | 1,219 | 1,608 | 388 | |
| JUN. 5 - JUN. 14 | 6,372 | 3,186 | 2,529 | | 657 |
| JUN. 15 - JUN. 24 | 1,659 | 829 | 1,075 | 246 | |
| JUN. 25 - JUL. 4 | 760 | 380 | 1,100 | 720 | |
| JUL. 5 - JUL. 14 | 795 | 398 | 854 | 456 | |
| JUL. 15 - JUL. 25 | 851 | 426 | 692 | 266 | |
| JUL. 26 - AUG. 4 | 245 | 122 | 109 | | 14 |
| AUG. 5 - AUG. 14 | 171 | 86 | 152 | 66 | |
| AUG. 15 - AUG. 25 | 147 | 74 | 131 | 57 | |
| AUG. 26 - SEP. 4 | 96 | 49 | 86 | 37 | |
| SEP. 5 - SEP. 14 | 65 | 32 | 58 | 25 | |
| SEP. 15 - SEP. 24 | 38 | 19 | 34 | 15 | |
| SEP. 25 - OCT. 4 | 196 | 98 | 174 | 76 | |
| OCT. 5 - OCT. 14 | 377 | 189 | 335 | 146 | |
| OCT. 15 - OCT. 25 | 436 | 218 | 387 | 169 | |
| OCT. 26 - OCT. 31 | 250 | 125 | 221 | 96 | |
| TOTAL-acre-feet | 29,284 | 14,648 | 17,787 | | |

## FRENCHMAN RIVER

The computed natural flow of the Frenchman River at the International Boundary from March 1 to October 31, 1982, was 114 700 $dam^3$ (93,000 acre-feet) or 133 percent of the average natural flow of the previous 42 years of record. Each country is entitled to 50 percent of the natural flow. A total flow of 82 500 $dam^3$ (66,900 acre-feet) was recorded at the International Boundary.

Deficit deliveries were recorded in 3 of the 24 division periods during the season. Deficits during the first and second division periods in October were refunded by a release from Newton Lake.

The division of the Frenchman River natural flow is summarized in Tables 4 and 4A, which follow. The detailed computation of the natural flow is given in Table 13 and the historical summary in Table 14 of Appendix A.

# TABLE 4

## SUMMARY OF FRENCHMAN RIVER DIVISION

## 1982

QUANTITIES IN CUBIC DECAMETRES

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | U.S.A. SHARE | RECEIVED BY U.S.A. | RECEIVED BY U.S.A. | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| MAR. 1 - MAR. 10 | 253 | 127 | 16 | | 111 |
| MAR. 11 - MAR 20 | 5 217 | 2 609 | 3 459 | 850 | |
| MAR. 21 - MAR. 31 | 9 877 | 4 939 | 7 358 | 2 419 | |
| APR. 1 - APR. 10 | 15 664 | 7 832 | 10 973 | 3 141 | |
| APR. 11 - APR. 20 | 29 326 | 14 663 | 21 574 | 6 911 | |
| APR. 21 - APR. 30 | 12 300 | 6 150 | 8 862 | 2 712 | |
| MAY 1 - MAY 10 | 4 980 | 2 490 | 2 989 | 499 | |
| MAY 11 - MAY 20 | 2 369 | 1 185 | 1 320 | 135 | |
| MAY 21 - MAY 31 | 8 004 | 4 002 | 6 227 | 2 225 | |
| JUN. 1 - JUN. 10 | 10 362 | 5 181 | 7 387 | 2 206 | |
| JUN. 11 - JUN. 20 | 5 782 | 2 891 | 3 850 | 959 | |
| JUN. 21 - JUN 30 | 1 184 | 592 | 652 | 60 | |
| JUL. 1 - JUL. 10 | 4 344 | 2 172 | 3 489 | 1 317 | |
| JUL. 11 - JUL. 20 | 1 422 | 711 | 1 178 | 467 | |
| JUL. 21 - JUL. 30 | 929 | 465 | 492 | 27 | |
| AUG. 1 - AUG. 10 | 562 | 281 | 913 | 632 | |
| AUG. 11 - AUG. 20 | 555 | 278 | 726 | 448 | |
| AUG. 21 - AUG. 31 | 302 | 151 | 164 | 13 | |
| SEP. 1 - SEP. 10 | 103 | 52 | 73 | 21 | |
| SEP. 11 - SEP. 20 | 0 | 0 | 42 | 42 | |
| SEP. 21 - SEP. 30 | 42 | 21 | 40 | 19 | |
| OCT. 1 - OCT. 10 | 418 | 209 | 34 | | 175 |
| OCT. 11 - OCT. 20 | 198 | 99 | 12 | | 87 |
| OCT. 21 - OCT. 31 | 545 | 273 | 697 | 424 | |
| TOTAL-cubic decametres | 114 738 | 57 373 | 82 527 | | |

# TABLE 4A
# SUMMARY OF FRENCHMAN RIVER DIVISION
# 1982

QUANTITIES IN ACRE-FEET

| DIVISION PERIOD AT INTERNATIONAL BOUNDARY | NATURAL FLOW | U.S.A. SHARE | RECEIVED BY U.S.A. | RECEIVED BY U.S.A. | |
|---|---|---|---|---|---|
| | | | | ABOVE SHARE | BELOW SHARE |
| MAR. 1 - MAR. 10 | 205 | 103 | 13 | | 90 |
| MAR. 11 - MAR 20 | 4,229 | 2,115 | 2,804 | 689 | |
| MAR. 21 - MAR. 31 | 8,007 | 4,004 | 5,965 | 1,961 | |
| APR. 1 - APR. 10 | 12,699 | 6,349 | 8,896 | 2,546 | |
| APR. 11 - APR. 20 | 23,775 | 11,887 | 17,490 | 5,603 | |
| APR. 21 - APR. 30 | 9,972 | 4,986 | 7,184 | 2,199 | |
| MAY 1 - MAY 10 | 4,037 | 2,019 | 2,423 | 405 | |
| MAY 11 - MAY 20 | 1,921 | 961 | 1,070 | 109 | |
| MAY 21 - MAY 31 | 6,489 | 3,244 | 5,048 | 1,804 | |
| JUN. 1 - JUN. 10 | 8,400 | 4,200 | 5,989 | 1,788 | |
| JUN. 11 - JUN. 20 | 4,687 | 2,344 | 3,121 | 777 | |
| JUN. 21 - JUN 30 | 960 | 480 | 529 | 49 | |
| JUL. 1 - JUL. 10 | 3,522 | 1,761 | 2,829 | 1,068 | |
| JUL. 11 - JUL. 20 | 1,153 | 576 | 955 | 379 | |
| JUL. 21 - JUL. 30 | 753 | 377 | 399 | 22 | |
| AUG. 1 - AUG. 10 | 456 | 228 | 740 | 512 | |
| AUG. 11 - AUG. 20 | 450 | 225 | 589 | 363 | |
| AUG. 21 - AUG. 31 | 245 | 122 | 133 | 11 | |
| SEP. 1 - SEP. 10 | 84 | 42 | 59 | 17 | |
| SEP. 11 - SEP. 20 | 0 | 0 | 34 | 34 | |
| SEP. 21 - SEP. 30 | 34 | 17 | 32 | 15 | |
| OCT. 1 - OCT. 10 | 339 | 169 | 28 | | 142 |
| OCT. 11 - OCT 20 | 161 | 80 | 10 | | 71 |
| OCT. 21 - OCT. 31 | 442 | 221 | 565 | 344 | |
| TOTAL-acre-feet | 93,018 | 46,512 | 66,905 | | |

ANNEX A

TREATY BETWEEN THE UNITED STATES AND GREAT BRITAIN RELATING TO BOUNDARY WATERS; AND QUESTIONS ARISING BETWEEN THE UNITED STATES AND CANADA - ARTICLE VI

INTERNATIONAL JOINT COMMISSION
1921 Order

TREATY
BETWEEN THE UNITED STATES AND GREAT
BRITAIN RELATING TO BOUNDARY WATERS;
AND QUESTIONS ARISING BETWEEN THE
UNITED STATES AND CANADA

ARTICLE VI

The High Contracting Parties agree that the St. Mary and Milk Rivers and their tributaries (in the State of Montana and the Provinces of Alberta and Saskatchewan) are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each. It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow, and that Canada is entitled to a prior appropriation of 500 cubic feet per second of the flow of St. Mary River, or so much of such amount as constitutes three-fourths of its natural flow.

The Channel of the Milk River in Canada may be used at the convenience of the United States for the conveyance, while passing through Canadian territory, of waters diverted from the St. Mary River. The provisions of Article II of this treaty shall apply to any injury resulting to property in Canada from the conveyance of such waters through the Milk River.

The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by the properly constituted reclamation officers of the United States and the properly constituted irrigation officers of His Majesty under the direction of the International Joint Commission.

INTERNATIONAL JOINT COMMISSION

ORDER

IN THE MATTER OF THE MEASUREMENT AND APPORTIONMENT OF THE WATERS OF THE ST. MARY AND MILK RIVERS AND THEIR TRIBUTARIES IN THE STATE OF MONTANA AND THE PROVINCES OF ALBERTA AND SASKATCHEWAN.

Whereas by Article VI of the Treaty entered into between the United States of America and His Majesty, the King of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India, signed at Washington on the 11th of January, 1909;

And whereas the said Reclamation and Irrigation Officers have been unable to agree as to the manner in which the waters mentioned in the said Article VI should be measured and apportioned;

And whereas, before giving directions as to the measurement and apportionment of the said waters, the International Joint Commission deemed it proper to hear such representations and suggestions thereon as the Governments of the United States and Canada, the Provinces of Alberta and Saskatchewan, and the State of Montana, and as corporations and persons interested might see fit to make, and for such purposes sittings of the Commission were held at the following times and places: At the city of St. Paul, in the State of Minnesota, on the 24th, 25th, 26th, 27th, and 28th days of May, 1915; at the city of Detroit, in the State of Michigan, on the 15th, 16th, and 17th days of May, 1917; at the city of Ottawa, in the Province of Ontario, on the 3rd, 4th, and 5th days of May, 1920; at the village of Chinook, in the State of Montana, on the 15th day of September, 1921; and at the city of Lethbridge, in the Province of Alberta, on the 17th day of September, 1921, when counsel and representatives of the said Governments, corporations, and persons appeared and presented their views;

And whereas, pending final decision as to the proper method of measuring and apportioning said waters, interim orders with reference thereto have been made by the International Joint Commission from time to time, the last of such orders bearing the date of 5th day of April, 1921;

And whereas the members of the International Joint Commission have unanimously determined that the said Reclamation and Irrigation Officers should be guided in the measurement and apportionment of said waters by the directions and instructions hereinafter set forth:

IT IS THEREFORE ORDERED AND DIRECTED by the Commission in pursuance of the powers conferred by the said Article VI of the said Treaty that the Reclamation and Irrigation Officers of the United States and Canada shall, until this order is varied, modified, or withdrawn by the Commission, make jointly the measurement and apportionment of the water to be used by the United States and Canada in accordance with the following rules:

St. Mary River.

I. (a) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is six hundred and sixty-six (666) cubic feet per second or less Canada shall be entitled to three-fourths and the United States to one-fourth of such flow.

(b) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is more than six hundred and sixty-six (666) cubic feet per second Canada shall be entitled to a prior appropriation of five hundred (500) cubic feet per second, and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the non-irrigation season the natural flow of the St. Mary River at the point where it crosses the international boundary shall be divided equally between the two countries.

Milk River.

II. (a) During the irrigation season when the natural flow of the Milk River at the point where it crosses the international boundary for the last time (commonly and hereafter called the Eastern Crossing) is six hundred and sixty-six (666) cubic feet per second or less, the United States shall be entitled to three-fourths and Canada to one-fourth of such natural flow.

(b) During the irrigation season when the natural flow of the Milk River at the Eastern Crossing is more than six hundred and sixty-six (666) cubic feet per second the United States shall be entitled to a prior appropriation of five hundred (500) cubic feet per second and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the non-irrigation season the natural flow of the Milk River at the Eastern Crossing shall be divided equally between the two countries.

Eastern Tributaries of Milk River.

III. The natural flow of the eastern (otherwise known as the Saskatchewan or northern) tributaries of the Milk River at the points where they cross the international boundary shall be divided equally between the two countries.

Waters not naturally crossing the boundary.

IV. Each country shall be apportioned such waters of the said rivers and of any tributaries thereof as rise in that country but do not naturally flow across the international boundary.

V. For the purpose of carrying out the apportionment directed in Paragraphs I, II, and III hereof the said Reclamation and Irrigation Officers shall jointly take steps:

(a) To ascertain and keep a daily record of the natural flow of the St. Mary River at the international boundary, of the Milk River at the Eastern Crossing, and of the eastern tributaries of the Milk River at the international boundary by measurement in each case:

(1) At the gauging station at the international boundary;

(2) At all places where any of the waters which would naturally flow across the international boundary at that particular point are diverted in either country prior to such crossing;

(3) At all places where any of the waters which would naturally flow across the international boundary at that particular point are stored, or the natural flow thereof increased or decreased prior to such crossing.

(b) To fix the amount of water to which each country is entitled in each case by applying the directions contained in paragraphs 1, 2, and 3 hereof to the total amount of the natural flow so ascertained in each case.

(c) To communicate the amount so fixed to all parties interested, so that the apportionment of the said waters may be fully carried out by both countries in accordance with the said directions.

VI. Each country may receive its share of the said waters as so fixed at such point or points as it may desire. A gauging station shall be established and maintained by the Reclamation or Irrigation Officers of the country in which any diversion, storage, increase, or decreases of the natural flow shall be made at every point where such diversion, storage, increase, or decrease takes place.

VII. International gauging stations shall be maintained at the following points:

St. Mary River near international boundary; the north branch of Milk River near international boundary; the south branch of Milk River near international boundary; Milk River at Eastern Crossing; Lodge Creek, Battle Creek, and Frenchman River, near international boundary; and gauging stations shall be established and maintained at such other points as the Commission may from time to time approve.

VIII. The said Reclamation and Irrigation Officers are hereby further authorized and directed:

(a) To make such additional measurements and to take such further and other steps as may be necessary or advisable in order to insure the apportionment of the said waters in accordance with the directions herein set forth.

(b) To operate the irrigation works of either country in such a manner as to facilitate the use by the other country of its share of the said waters and subject hereto to secure to the two countries the greatest beneficial use thereof.

(c) To report to the Commission the measurements made at all international and other gauging stations established pursuant to this order.

IX. In the event of any disagreement in respect to any matter or thing to be done under this order the said Reclamation and Irrigation Officers shall report to the Commission, setting forth fully the points of difference and the facts relating thereto.

X. The said order of the Commission, dated the 6th day of April 1921, is hereby withdrawn, except with respect to the report to be furnished to the Commission thereunder.

Dated at Ottawa, Canada, this 4th day of October, 1921.

O. GARDNER,
C. A. MACGRATH,
C. D. CLARK,
HENRY A. POWELL,
W. H. HEARST,
MARK A. SMITH.

# ANNEX B

## International System of Units

## (SI) Conversions

## INCH-POUND TO INTERNATIONAL SYSTEM OF UNITS

## (SI) CONVERSION

The 1982 Report to the International Joint Commission on the Division of the Waters of the St. Mary and Milk Rivers uses dual units (SI and inch pound).

The two inch-pound units that have been used in previous reports are cfs-days and acre-feet.

1 cfs-day = 86,400 cubic feet

1 acre-foot = 43,560 cubic feet

1 cfs-day = 1.9835 acre-feet

The SI unit replacing the inch-pound units is the cubic decametre ($dam^3$)

1 $dam^3$ = 1000 cubic metres

1 cubic metre = 35.315 cubic feet

1 $dam^3$ = 35,315 cubic feet

1 acre-foot = 1.2335 $dam^3$

1 cfs-day = 2.4466 $dam^3$

# ANNEX C

## List of Gauging Stations

INTERNATIONAL GAUGING STATIONS OPERATED JOINTLY

BY

CANADA AND UNITED STATES

ST. MARY AND MILK RIVER DRAINAGE BASINS

1982

| Map Index | Station Name |
|---|---|
| | ST. MARY RIVER BASIN |
| 05AE027 | St. Mary River at International Boundary |
| 05AE029 | St. Mary Canal at St. Mary Crossing near Babb, Montana |
| 05AE036 | Lake Sherburne at Sherburne, Montana |
| | MILK RIVER BASIN |
| 11AA001 | North Milk River near International Boundary |
| 11AA005 | Milk River at Milk River |
| 11AA025 | Milk River at Western Crossing of International Boundary |
| 11AA031 | Milk River at Eastern Crossing of International Boundary |
| 11AA032 | North Fork Milk River above St. Mary Canal near Browning, Montana |
| 11AA033 | South Fork Milk River near Babb, Montana |
| | LODGE CREEK TRIBUTARY BASIN |
| 11AB001 | Middle Creek below Middle Creek Reservoir |
| 11AB009 | Middle Creek near Saskatchewan Boundary |
| 11AB060 | Spangler Ditch near Govenlock |
| 11AB080 | Middle Creek Reservoir |
| 11AB083 | Lodge Creek below McRae Creek at International Boundary |
| 11AB089 | Altawan Reservoir near Govenlock |

## BATTLE CREEK TRIBUTARY BASIN

| | |
|---|---|
| 11AB018 | Nashlyn Canal near Consul |
| 11AB027 | Battle Creek at International Boundary |
| 11AB044 | McKinnon Ditch near Consul |
| 11AB058 | Richardson Ditch near Consul |
| 11AB075 | Lyons Creek at International Boundary |
| 11AB077 | Cypress Lake West Outflow Canal |
| 11AB078 | Cypress Lake West Inflow Canal |
| 11AB084 | Vidora Ditch near Consul |
| 11AB085 | Cypress Lake West Inflow Canal Drain |
| 11AB102 | Gaff Ditch near Merryflat |

## FRENCHMAN RIVER TRIBUTARY BASIN

| | |
|---|---|
| 11AC001 | Frenchman River below Eastend Reservoir |
| 11AC037 | Cypress Lake |
| 11AC041 | Frenchman River at International Boundary |
| 11AC052 | Eastend Canal near Eastend |
| 11AC054 | Newton Lake Main Canal |
| 11AC055 | Eastend Reservoir |
| 11AC056 | Newton Lake |
| 11AC060 | Cypress Lake East Outflow Canal |
| 11AC062 | Frenchman River below Newton Lake |
| 11AC063 | Huff Lake |
| 11AC064 | Belanger Creek Diversion to Cypress Lake |
| 11AC065 | Huff Lake Gravity Canal |
| 11AC066 | Huff Lake Pumping Canal |

## GAUGING STATIONS OPERATED INDEPENDENTLY

## BY EITHER

## CANADA OR UNITED STATES

## IN THE

## ST. MARY AND MILK RIVER DRAINAGE BASINS

## 1982

| Map Index | Station Name | Operated By |
|---|---|---|
| | **ST. MARY RIVER BASIN** | |
| 5-0145* | Swiftcurrent Creek at Many Glacier, Montana | U.S.A. |
| 5-0175* | St. Mary River near Babb, Montana | U.S.A. |
| 05AE002* | Lee Creek at Cardston | Canada |
| 05AE005* | Rolph Creek near Kimball | Canada |
| 05AE006* | St. Mary River near Lethbridge | Canada |
| 05AE016* | Pothole Creek at Russell's Ranch | Canada |
| 05AE021* | Magrath Irrigation District Canal near Spring Coulee | Canada |
| 05AE025* | St. Mary Reservoir near Spring Coulee | Canada |
| 05AE026* | Canadian St. Mary Canal near Spring Coulee | Canada |
| 05AE038* | Pothole Turnout near Magrath | Canada |
| 05AE041* | Dry Coulee near Magrath | Canada |

## MILK RIVER BASIN

| | | |
|---|---|---|
| 11AA028* | Bear Creek near International Boundary | Canada |
| 11AA029* | Miners Coulee near International Boundary | Canada |
| 11AA034* | Milk River near Writing-on-Stone Park | Canada |
| 11AA035* | Milk River near Pendant d'Oreille | Canada |

## LODGE CREEK TRIBUTARY BASIN

| | | |
|---|---|---|
| 11AB008* | Middle Creek above Lodge Creek | Canada |
| 11AB082* | Lodge Creek at Alberta Boundary | Canada |
| 11AB091 | Michele Reservoir near Elkwater | Canada |
| 11AB092 | Greasewood Reservoir near Elkwater | Canada |
| 11AB094 | Bare Creek Reservoir near Elkwater | Canada |
| 11AB097 | Cressday Reservoir near Cressday | Canada |
| 11AB098 | Jaydot Reservoir near Jaydot | Canada |
| 11AB099 | Mitchell Reservoir near Elkwater | Canada |
| 11AB103 | Squaw Coulee near Willow Creek | Canada |
| 11AB104 | Massy Reservoir near Elkwater | Canada |
| 11AB108* | Middle Creek near Govenlock | Canada |
| 11AB113 | Middle Creek Reservoir Main Outlet | Canada |
| 11AB114 | Middle Creek Reservoir Bedford Outlet | Canada |
| 11AB115 | Middle Creek Reservoir Flood Spillway | Canada |

## BATTLE CREEK TRIBUTARY BASIN

| | | |
|---|---|---|
| 11AB020* | Shepherd Ditch near Consul | Canada |
| 11AB090 | Reesor Reservoir | Canada |
| 11AB095 | Adams Lake | Canada |
| 11AB096* | Battle Creek near Consul | Canada |
| 11AB100* | Battle Creek above Cypress Lake West Outflow Canal | Canada |
| 11AB101* | Battle Creek below Nashlyn Project | Canada |
| 11AB117* | Battle Creek at Alberta Boundary | Canada |

## FRENCHMAN RIVER TRIBUTARY BASIN

| | | |
|---|---|---|
| 11AC025* | Denniel Creek near Val Marie | Canada |
| 11AC068 | Val Marie Pump No. 1 | Canada |

## ROCK CREEK TRIBUTARY BASIN

| | | |
|---|---|---|
| 6-1695* | Rock Creek below Horse Creek near International Boundary | U.S.A. |

* Data not included in this report or appendices